

Zoonosis

Prospects and challenges for medical anthropology

Frédéric Keck and Christos Lynteris

In recent years anthropologists have shown an increasing interest in ‘zoonoses’: diseases naturally transmitted from nonhuman animals to humans, such as anthrax, brucellosis, influenza, hantavirus syndromes, Middle East respiratory syndrome, plague, and rabies. Animal-derived epidemic crises such as bovine spongiform encephalopathy (BSE) (1996), severe acute respiratory syndrome (SARS) (2003), swine flu (2009), and Ebola (2014) outbreaks have further fuelled research and debate around this type of infectious disease. In this flourishing ethnographic trajectory, zoonotic diseases and outbreaks have been approached by a wide array of analytical perspectives. Positioned and enriched by concurrent developments in biosecurity studies, critical animal studies, and debates around the notion of the Anthropocene, anthropological research has focused on discourses and practices relating to human-animal relations as sites of medical, epidemiological and public health problematisation, intervention, and contestation.

Breaking new ground in this research trail, this special issue aims to foster anthropological debate by focusing on the animal-human link that forms the aetiological site of zoonotic infection. The articles in this issue provide robust ethnographic and historical-anthropological studies of human-animal relations, as both revealed and transformed by the medical focus on zoonosis. We thus aim to bring medical anthropology together with animal studies in ways that highlight the contribution of anthropology to interdisciplinary research on zoonoses and the impact of this research on contemporary practices of global health.

Changing definitions of zoonosis

As the definition of zoonosis has been unstable since its first articulation in the second half of the nineteenth century, and as the majority of the articles in this issue concern zoonotic disease in the present day, we have opted to approach zoonosis in its current sense: a disease that is harboured and transmitted from vertebrate nonhuman animals to humans. This means that diseases communicated to humans from invertebrates, such as malaria, are not included in this discussion. The reason for maintaining this distinction is not merely taxonomical. In the course of the development of medicine and the biosciences in modern times, research, discourse, and policy relating to zoonotic and vector-borne diseases have followed unique strands, which, though often crossing, are still institutionally and epistemologically maintained today. This does not mean, however, that contributions to this special issue do not benefit from both established and pioneering anthropological works on vector-borne disease, such as malaria and dengue, as well as other diseases involving nonhuman agents, such as (zooplankton-related) cholera (Delaporte 1991; Nading 2014). Nor does it presuppose that there is a specificity to relations between humans and vertebrates among other nonhuman agents because they concern animal beings and populations of different sizes and consistencies. In other words, the historical and ethnographic specificity of zoonosis does not preclude the value of wider medical anthropological and historical debates on nonhuman ecologies of diseases, without which this novel field would be unable to develop.

The notion of zoonosis appeared in medical discourse concurrently with the great bacteriological discoveries of the end of the nineteenth century (Gould 1894; Dorland 1900). And yet, as Nicholas Evans shows in this issue, the term was not employed in the problematisation of major zoonotic outbreaks (such as the Third Plague Pandemic, 1894–1959) until much later. The systematic application of the term to animal-derived diseases and epidemics was indeed concurrent with the rise of disease ecology, and especially the work of Karl F. Meyer in the 1930s and 1940s (Honigsbaum 2015), later systematised by Carl Schwabe (1984). On the one hand, this meant that roughly between 1940 and 1990, zoonotic ontologies and epistemologies, as well as zoonosis-focused biopolitical regimes, developed around a notion central to the wider frame of disease ecology and its Soviet counterpart: natural focality (also known as ‘natural nidality’). At least for the former, this implied that zoonosis was approached through what we may call a cybernetic epidemiological reasoning, which emphasises distinct phases of pathogen transmission and the thresholds between them. Hence pathogens would be seen as circulating primordially amongst given animal species in what became known as an enzootic, in which a pathogen is maintained through space and time in a given animal population. Secondly, pathogens were seen as entering a discrete cycle of circulation/reproduction known as an epizootic. During this phase, the pathogen would create massive mortality events or ‘kill-offs’ amongst its hosts, decimating

them. Finally, through a linear rather than circular process, the pathogen would be communicated from its epizootic phase to humans, causing a zoonotic infection.

Within the framework of disease ecology this model of infection would become formative for notions and research methods regarding zoonotic disease. Its focus lay on the threshold of enzootic, epizootic, and zoonosis, as well as, on a practical level, on the effective ‘noise’ that can prevent their development (Lynteris 2017). This was however always already a doubtful model of infection. If in the mid-1940s Meyer already expressed reservations as to whether epizootics were an adequate and necessary condition for human plague infection (Honigsbaum 2015), more recently Kenneth Gage and Michael Kosoy (2005, 508–09) have argued, referring to plague, that, ‘the evidence for separate enzootic and epizootic cycles is often unconvincing, and epizootics might simply represent periods of greatly increased transmission among the same host and fleas that support *Y. pestis* during interepizootic periods’. And yet this model of zoonotic infection continues to be employed today, without, however, any longer holding an aetiological monopoly in explaining animal-human infection.

Since the early 1990s, a new mechanism has come into focus in the explanation of zoonosis. Known widely as ‘emergence’, this focuses on the spread of novel pathogens from animals to human populations. No longer requiring an enzootic-epizootic-zoonosis chain, but rather a process described as ‘species-jump’ or ‘spillover’, emergence has marked new directions for the configuration of zoonosis (Quammen 2012). Rather than revolving around already-existing pathogens and how they circulate in specific ecological contexts, the focus on emergence required a shift of attention to what we may call ‘viral ontogenesis’. This is supposed to involve the mutation of a given animal-borne micro-organism so that it leads to human infection. Whilst under the previous paradigm only population-level transmission was epidemiologically meaningful, for emergence to occur an individual-level encounter is sufficient, provided that in the process of its original mutation or at a later stage (within the human ‘patient zero’) the pathogen also becomes transmissible between humans, in other words, implicated in human contagion.

A crucial factor sustaining scientific and governmental interest in emergence has been the idea that a novel pathogen may (or, in the prevailing outbreak narrative, inevitably will) cause a human extinction event. Conjuring up images of the Influenza Pandemic of 1918 (Caduff 2015), magnified through globalisation, free trade, and liberal democratic civil rights, this pandemic fantasy has in recent decades become the platform of massive scientific, political, and economic investment. Besides other major ontological and biopolitical transformations that the introduction of this new fear has brought about (see below), it has also reconfigured animals as agents of humanity’s future return to ‘the stone age’. Envisioned as the sources not simply of human extinction but also of civilisation collapse (for those who survive),

animals are hence rendered into agents of the reanimalisation of humankind, or, in other discourses, as wreaking revenge against humans for the wrongs of domestication.

This is not to say however that zoonosis-as-emergence has simply come to replace the older model of zoonotic infection. In fact, the two models are employed concurrently, operating on different aetiological registers whilst also implying distinct disease ontologies and disease-related biopolitical regimes. Hence it is crucial to take into consideration that though we are today operating within a zoonotic framework that is predominantly informed by the emergence paradigm, this has not been the only way of scientifically configuring zoonosis. The working together – in ways congruent and unsettling, complementary and antagonistic – of different models of animal-human infection is crucial at every step of scientific, governmental, and demotic configurations of human-animal relations. It is, moreover, at the troubled seams of the interaccommodation between these models that notions and practices regarding zoonosis are developed and contested today.

Ontological and biopolitical challenges

This troubled and enduring shift from a cybernetic definition of zoonosis to a focus on emergence and the contemporary operation of dynamic/agonistic zoonotic assemblages is paralleled by shifts in the objects and methods of social anthropology, which may explain the theoretical opportunities and challenges zoonoses present for our discipline.

In the last ten years, anthropological research has elaborated on the changes caused by practices of global health as regards rationalities of risk. Anthropologists have traced the techniques that aim at securing the circulation of living beings, assembled under the term ‘biosecurity’, and followed their genealogy in the literature of disaster management (Lakoff and Collier 2008). This literature has stressed the new imperative to prepare for events whose probability cannot be calculated but whose consequences may be catastrophic. Techniques of preparedness, in contrast with earlier techniques of prevention such as insurance based on population statistics, aim at mitigating the threat of an event portrayed as imminent, by amplifying early warning signals whilst also organising simulation exercises based on worst-case scenarios or stockpiling drugs and vaccines (Lakoff 2017).

From this perspective, the emergence of zoonoses appears as a type of event for which contemporary societies have to prepare or be prepared, alongside hurricanes, floods, climate change, and terrorist attacks. The circulation of live animals across the planet, either in wild migrations or in global food chains, increases the probability of viral mutations crossing species barriers, in a way that cannot be calculated but only imagined through the mapping simulations of bioinformatics. If this imaginary often borrows traits from colonial images of

tropical diseases ‘breeding’ in overseas corners of empires, it also organises visions and practices of a rapid-reaction ‘global clinic’ that moves quickly to the site of emergence in order to stop the new pathogen before it spreads to humans (King 2002).

The notion of ‘animal reservoir’ has thus taken on new meanings in this global context, conjuring images of the tropical south with the idea of an indeterminate source of potentialities that needs to be monitored if not controlled. South China, for instance, has been depicted as an ‘influenza epicentre’ due to its ecology connecting wild birds, poultry, pigs, and humans (Keck 2010). Discussing another Sino-centric localisation of flu emergence, in this volume Lyle Fearnley analyses how the redefinition of Poyang Lake as a hotspot for avian flu has transformed the perceptions of bird diseases among poultry farmers. The distinction between *qinlingan* (avian influenza), as the possibility of a massive culling imposed by the state, is distinguished by farmers from *lingan* (flu), as an ordinary duck disease that fits in economic anticipations.

The human/animal interface has thus become a significant site of reconfiguration of global health, bringing together environmentalists, veterinarians, and physicians under the motto of ‘One World, One Health’. In practice this injunction to global professional solidarity aims at sharing databases of pathogen mutations (viruses or bacteria, as in the growing concern for multidrug resistance) among networks of surveillance of animal health and human health. While this programme creates new collaborations between biologists and social anthropologists, it has been argued that it does not take into account the multiple ontologies that appear with the redefinition of zoonoses as emergence (Hinchliffe 2015). More specifically, the One Health model largely fails to take into consideration that in order for animals and humans to be united in a universal entangled health paradigm, they first need to be separated in ways that render them into ontologically distinct entities in their ethnographically specific context. Hence, to take the example of human-animal interaction studied by Francis Levesque (this issue) in his examination of rabies in the Canadian north, measures implemented by health authorities to control rabies have to disrupt the ‘oneness’ of humans and dogs as a unity between the living and ancestors, so as to forge a new unity of them as distinct but entangled species.

The last twenty years have also seen what has been called an ‘ontological turn’ in social anthropology, which should be understood in two ways. First, it refers to a new gaze on nonhuman animals in human societies, which is not caught up in the symbolic webs of culture but is rather attentive to the interactions and entanglements between coevolving species. In this new mode of anthropological description, animals are not considered as passive carriers of long-term human symbols but as actors in unstable and vulnerable networks of coexistence (Descola 2015; Kelly 2014). In a second sense, the ontological turn

takes seriously statements that attribute actions to animals and brings them into conversation with other claims about nonhuman agency (Kohn 2013, 2015). Notions of local knowledge taken from ethnozoology are thus reactivated in the wake of the challenges raised by zoonoses, raising new questions about the modes of agency of pathogens transmitted from animals to humans. As Sandrine Ruhlmann and Nicolas Lainé show in this volume, the knowledge of Mongolian pastoralists about their cattle or of Laotian mahouts about their elephants must be taken seriously when these animals are affected by zoonoses, as they open the spectrum of agencies and causalities in the entanglement of humans, animals, and pathogens.

Integrating the challenges posed by biopolitics and ontology-focused developments in the discipline, this volume thus proposes to bring zoonotic regimes on the ethnographic ground beyond the usual cooperation-resistance binary. Local knowledges of pathogenicity are approached neither as resources for participatory surveillance nor simply as resistance to the global clinic/laboratory. Rather, they appear as mutually unsettling yet always already interconstitutive modes of understanding and acting upon a situation where something that goes wrong in relations between humans and animals is attributed to the sharing/exchange of beings or substances. In this way, for example, Guillaume Lachenal (2015) has shown how different modes of representation and imaging of zoonotic pathogens do not only conflict or collaborate but also ironically can parody each other: rap songs in Côte d'Ivoire use the motif of bird flu to both criticise the investment of international organisations in simulation exercises and raise fear about the potentialities of poultry crossing political frontiers. Similarly, in this volume Deborah Nadal looks at the behaviours that may have facilitated the spread of rabies from dogs to humans in India, but she finds rumours about the effects of vaccination and 'puppy pregnancy' in humans at the heart of understandings of human-animal interaction and interexistence.

Webs of causality

Over the years, the implication of animals as sources of human disease has generated complex patterns of problematisation of human-animal contact and entanglement (Brown and Kelly 2014; Narat et al. 2017). Scientific models of zoonosis reproduce, reorient, and complicate hegemonic accusatory frameworks as regards human-animal interaction and coexistence. As Nicholas Evans discusses in this volume, within the context of bacteriological breakthroughs at the end of the nineteenth century, concerns over animal-human infection became established around the singling out of specific species as spreaders of particular diseases. Hence, as bubonic plague spread across the globe, the rat, which up until the mid-1890s was largely perceived as a victim of miasmatic gases and even as contributing to the Victorian city's sanitation (Pemberton 2014), gradually came to be seen

as the main or even sole source of that disease. As the sanitary slogan ‘no rats, no plague’ spread alongside the path of the disease, the rat became an icon of the lack of hygienic modernity, a locus of scientific and sanitary labour, and a carrier of behavioural and infrastructural change, including sanitary-utopian plans in architecture and urban planning. As understandings of the disease and its mode of transmission (involving the rat flea, *Xenopsylla cheopis*) shifted, mass rat-extermination operations were accompanied or (at least partly) replaced by rat-proofing. Gradually however, the introduction of a strictly speaking zoonotic framework for understanding plague shifted attention away from the rat towards wild or so-called sylvatic hosts of the disease. Already established in earlier research (predominantly in Russia, China, and South Africa) this multiplicity of hosts and their interrelation were reconsidered within the broader framework of disease ecology. The new epistemic focus required an understanding of complex systems of infection, so that epidemiological attention could no longer be fixed on a single species.

It is thus pertinent, within this schematic genealogy of zoonosis, to note that in recent years the introduction of emergence has once again shifted attention to zoonotic protagonists. With the idea of the spillover taking central stage, singular animal species have come to bear the burden of epidemic blame. In the case of SARS, this role was initially assumed by civet cats, and later by bats, a species suspected today of a range of zoonotic infections (including Ebola) and potential spillover events. In the case of MERS, as Sarah Cabalion’s article in this issue shows, the blame has largely fallen on camels, as the transmission of the causative coronavirus has been observed in humans only in the Arabian Peninsula whilst antibodies have been found in camels all over the Sahel and Central Asia. Through this identification, the Arabian Peninsula has thus come to play a role in the research on MERS-CoV similar to that of South China as a hotspot for emerging influenza, with new relations between humans and animals and new modalities of early detection and spread of information being established.

On the one hand, this renewed focus on zoonotic protagonists has been accompanied by a return to pre-zoonotic modes of problematisation. Hence, ‘spillover’, the mythic contact event popularised by films like *Contagion* (Soderbergh 2011), where a human pandemic is brought about when ‘the wrong pig met up with the wrong bat’, marks a return to what Evans (this issue) underlines as the individual-body ontological focus of colonial medical frameworks of animal-human infection. Yet rather than simply involving a reinvestment of epidemiological suspicion at the individual level, this shift also marks a return to questions about the role of ‘culture’ in zoonotic transmission. As Ann Kelly and Almudena Marí-Sáez observe in this volume, the recent Ebola epidemic has redrawn the boundaries between what should be shown and what should be hidden, as the epidemiology of zoonoses relies on an imaginary of darkness brought to light.

By being configured as pertinent to ‘questions of how to coexist or how to conduct oneself with animals’ (Porter 2013, 135), the notion of culture is employed so as to render political, economic, and political-economic drivers of infectious disease patterns invisible. What, however, differentiates this resurgent discourse on ‘culture vectors’ from colonial narratives is the fact that it focuses away from questions of effective or ineffective human-animal separation and towards questions of sustainable interspecies entanglement. Hence, whilst zoonosis-as-emergence absorbs and mobilises critical animal studies and posthuman frameworks (flows, networks, and entanglements) that emphasise interspecies horizontality and enmeshment, it also tends to reinforce racial, class, and gender hierarchies among humans. In her work on zoonoses in contemporary Vietnam, Porter (2013, 142) describes how, in the context of fears about bird flu, individuals who in one instance stole poultry designated for culling were depicted in the local press as grinning monkeys wearing T-shirts bearing the words ‘greedy’ and ‘ignorant’.

At the same time, the aetiological model of emergence fosters what Paul Farmer (1992) has called ‘geographies of blame’, which configure areas of the world or types of environments into the breeding grounds of viral ontogenesis. This is at one and the same time a spatial and temporal configuration of emergence as a process unfolding at the margins of modern civilisation. As several authors have stressed, the self-presentation of ‘virus-hunters’ like Nathan Wolfe as jungle warriors and the systematic problematisation of bush meat practices in Africa and ‘wet markets’ in East Asia have contributed to a radical ‘othering’ of emergence (Keck 2015; Lachenal 2015; Lynteris 2016c; Mason 2010; Zhan 2005). In Priscilla Wald’s (2008, 7–8) words, ‘primitive farms . . . like the “primordial” spaces of African rainforests, temporalise the threat of emerging infections, proclaiming the danger of putting the past in (geographical) proximity with the present’ (see also Mason 2010, 13).

If Porter (2013, 133) is right to stress that the configuration of zoonosis involves ‘how humans should conduct themselves in the name of an existence they share with other species’, such constitution of a ‘threatening intimacy’ (137) is already always conditioned upon hierarchical configurations of human-to-human relations. Yet not all framings of human-animal relations in terms of zoonosis are based on a negative evaluation of cross-species intimacy. Indeed, in order to have a hierarchy of human-animal interactions (class, gender, race, or otherwise based), we need to have a range of interactions that are, or are presented as, positive. This mode of valorisation has a long history in medical and public health discourse that cannot be examined in detail here. To return, as a brief illustration, to the example of plague, the establishment of the rat as a zoonotic protagonist in colonial times led to the prolific labour of what we may call ‘cultural diagnosis’. As doctors and historians began scouring the past for signs of the plague’s pathogenic role, what this archival work produced was a range of historical references to animal–human infection. Hence Wu Liande (Wu Lien-teh et al. 1936), the leading plague expert in Republican China,

would dig out an eighteenth-century poem by Shi Daonan and interpret its opening lines, describing humans perishing after observing rats dying around them, not only as evidence of a plague epidemic striking the Qing Empire but also as a local knowledge of rats as a source (rather than simply copatients) of pestilence. Similarly, at the turn of the twentieth century, the interpretation of the rodents mentioned in the biblical tract on the Plague of Ashdod (also known as the Plague of the Philistines; I Samuel 6:5) as a reference to plague bacillus-carrying rats or mice became canonical in tropical medicine treatises (see for example Simpson 1905; see also Berger 2007). This urge to identify references to zoonotic protagonists in historical and literary texts was characterised by a hermetic ideal: the belief that behind mythic or literary form lays scientific truth.

Yet this operation was not simply limited to the reinterpretation of the past. At the same time, colonial doctors and epidemiologists sought to interpret ethnographically available myths and rituals of affected populations as stemming from a traditional knowledge or concern regarding specific animal-human infections. Perhaps the most striking example of this enterprise, in terms of its extent, systematicity, and impact, was the interpretation of Mongol myths as indexes of native knowledge of plague amongst local marmots (Lynteris 2016b). What all these instances shared was a medical materialist framework, which, following Mary Douglas's (1993) definition, reduced complex human-animal interactions (ritual, cosmological, economic, and other) to a proto-hygienic corpus of knowledge. As a spillover is always an unprecedented event that cannot form the basis of a preventative 'tradition', what becomes epidemiologically significant is to examine how in different ethnographic contexts the probability of emergence (and by extension human extinction) is amplified through inappropriate human-animal contact or entanglement. Hence, whereas colonial models at least allowed for nonscientific modes of knowledge to contain a sanitary potential (through their medical materialist reduction, of course), in the case of emergence even this shadow of positivity has disappeared. With all human-animal coexistence being subsumed under the sign of the 'coming plague', every human-animal interaction becomes a potential pandemic ground zero.

This mythic configuration of animals as the once and future sources of human extinction leads to the encompassment of human-animal interactions in what Carlo Caduff (2015) has analysed as patterns of pandemic prophecy, whilst at the same time rendering these animals into sentinel devices for the always-deferred end of humankind (Keck 2015). Moreover, as in mythological narratives, zoonosis-related diagnostic discourses insist on the potentiality of pathogens to reverse relations between humans and animals in such a way that the carrier becomes the victim. In the case of tuberculosis in Laos, described by Nicolas Lainé (this issue), for example, the seropositivity of elephants for TB thus raises several questions: Does the disease come from mahouts or from elephants? Does it threaten elephants or tourists?

The capacity of concern about elephant TB to cross borders of the United States, France, and countries in Southeast Asia derives precisely from this instability in the chain of transmission and blame. Finally, besides scientific narratives, the mythic dimension of animal sources of disease today is also evident in popular representations of zoonosis. Either in the form of epidemic photography, focusing as it does on wet markets and bush meat consumption (Lynteris 2016c), or in blockbuster epidemic apocalypse films like *28 Days Later* (Boyle 2002) and *Rise of the Planet of the Apes* (Wyatt 2011), where the killer virus jumps species so as to eradicate humanity, the mythic ‘animal zero’, wherein the pandemic-to-be is lurking, has achieved a global spectatorship (Lynteris 2016a). For all its discourse of entanglement and interspecies enmeshment then, portraying animals as incubators, carriers, reservoirs, or spreaders of human infection, and ultimately a human extinction event, grounds the scientific study of zoonosis on a hard anthropocentric ground.

Scope of and challenges for collaborative research on zoonoses

This volume aims to explore zoonosis as a scientific field of inquiry and the challenge zoonosis poses to the anthropological study of human-animal relations as pertaining to questions of health, illness, and disease. For whilst opportunities currently arise for ever-more systematic interaction between anthropologists and life scientists, this interaction often appears to be conditioned on the unconditional acceptance of evidential regimes, deriving from solidified hierarchies of knowledge and the research funding that goes with it. Beyond the celebration of interdisciplinary, ‘cross-barrier’ joint research and the recognition of anthropology as being of value in the context of urgencies like the recent Ebola epidemic lies the fact that all cross-discipline collaboration comes at a price. In the context of this constantly renegotiated collaboration trajectory, virologists and epidemiologists raise questions regarding the perception of zoonotic risks, which often reduce anthropologists to the role of data-providers on ‘how “natives” think’ or on hygienic (infection-stopping) or unhygienic (infection-promoting) beliefs and practices. Yet life scientists are also prone to reason historically and ecologically when they draw evolutionary narratives of the emergence of zoonotic pathogens, with the social sciences often finding a distorted image of their own activity in the big phylogenetic trees of viral mutations. Still, at the same time, we often find that on an individual level, and in spite of the institutional hierarchies framing our interactions, collaboration with life scientists is often sincere, open-ended, and productive of interdisciplinary trust and innovation. There are hence no simple epistemic or ethical guidelines that can describe what would be a ‘best practice’ approach for the collaboration of anthropologists with life scientists in this field of inquiry. Yet there can be no doubt that our current predicament – where extra-academic agendas demand ‘impact’ and such impact unequally corresponds to knowledge that promotes commercial and governmental agendas – demands the initiation of an open dialogue about the benefits, casualties, and risks of this

institutionally unequal interaction. As the ethnographic method seeks to bring the ethnographer into the description of the situation observed, anthropology must start from the configuration of zoonosis as a public health question so as to open multidisciplinary perspectives on the complex webs of causality between humans and animals. The anthropology of zoonosis can then only be accomplished through the study of health, illness, and disease as dynamic frameworks and experiences involved in and structuring human-animal interactions whilst also critically examining the epistemic, political, and economic frameworks giving rise to scientific disciplines and regimes concerned with animal-human coexistence.

About the authors

Frédéric Keck is a researcher at the Laboratory of Social Anthropology and director of the Research Department of the Quai Branly Museum. After studying philosophy at the Ecole Normale Supérieure in Paris and anthropology at the University of California at Berkeley, he has been researching the history of anthropology and contemporary biopolitical questions. He has published *Claude Lévi-Strauss, une introduction* (Pocket-La découverte, 2005), *Lucien Lévy-Bruhl, entre philosophie et anthropologie* (CNRS Editions, 2008), and *Un monde grippé* (Flammarion, 2010). He has coedited with Noémie Vialles *Des hommes malades des animaux* (L'Herne, 2012) and with Andrew Lakoff *Sentinel Devices* (Limn, 2013).

Christos Lynteris is Senior Lecturer in Social Anthropology at the University of St Andrews, UK, and Principal Investigator of the ERC-funded research project 'Visual Representations of the Third Plague Pandemic'. A medical anthropologist investigating epistemological, biopolitical, and aesthetic aspects of infectious disease epidemics, he is the author of *The Spirit of Selflessness in Maoist China: Socialist Medicine and the New Man* (Palgrave, 2012) and *Ethnographic Plague: Configuring Disease on the Chinese-Russian Frontier* (Palgrave, 2016), and with Nicholas Evans he has recently coedited *Histories of Post-Mortem Contagion: Infectious Corpses and Contested Burials* (Palgrave, 2018).

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